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ABSTRACT

This annotated bibliography lists research related to mathematics teaching and learning at the elementary school level which was published during 1970. It is divided into three major sections. The first section (References) contains articles and compilations which review groups of research studies or basic research techniques. The second section (Articles) contains research reports which appeared in major journals during 1970. The final section (Dissertation Abstracts) contains brief annotations of dissertations announced in "Dissertation Abstracts" during 1970. Each annotation contains the major conclusions of the research, the age or grade level of subjects, the unit of analysis, and the number of units of analysis in the study. (JG)

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MATHEMATICS EDUCATION REPORTS

RESEARCH IN ELEMENTARY SCHOOL MATHEMATICS-1970:

ANNOTATED LIST OF RESEARCH REFERENCES

by

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ERIC Information Analysis Center for
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April, 1971

This annotated bibliography lists research related to mathematics teaching and learning at the elementary school level which was published during 1970. It is divided into three major sections. The first section (References) contains articles and compilations which review groups of research studies or basic research techniques. The second section (Articles) contains research reports which appeared in major journals during 1970. The final section (Dissertation Abstracts) contains brief annotations of dissertations announced in Dissertation Abstracts during 1970. Only articles and dissertations which relate to mathematics education at the elementary level are included in these sections. The ERIC Information Analysis Center for Science and Mathematics Education is pleased to make this annotated bibliography available as a Mathematics Education Report.

F. Joe Crosswhite
and
Jon L. Higgins
Editors

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RESEARCH IN ELEMENTARY SCHOOL MATHEMATICS - 1970: ANNOTATED LIST OF RESEARCH REFERENCES

Marilyn N. Suydam
The Pennsylvania State University

I. References

Aiken, Lewis R., Jr. Nonintellective Variables and Mathematics Achievement: Directions for Research. J. Sch. Psychol. 8: 28-36; Mar. 1970.

Empirical studies on attitudes, anxiety, interests, and other personal and social factors affecting achievement in mathematics are discussed, with 31 references cited. (grades K-12)

Aiken, Lewis R., Jr. Attitudes Toward Mathematics. R. Ed. Res. 40: 551-596; Oct. 1970.

Studies categorized by methods of measuring attitudes; distribution and stability of attitudes; the relationship of attitude to achievement and to personality and social factors; teacher characteristics, attitude, and behavior; instructional method and curriculum; and attitude development are discussed, with 109 references cited. (grades K-12)

Aiken, Lewis R., Jr. Affective Factors in Mathematics Learning: Comments on a Paper by Neale and a Plan for Research. J. Res. Math. Ed. 1: 251-255; Nov. 1970.

A diagram for a comprehensive research program on attitudes specific to mathematics learning, with careful instrument development, analysis of data from instrument administration, and experimentation to effect attitude change, is presented.

Becker, Jerry P. Research in Mathematics Education: The Role of Theory and of Aptitude-Treatment-Interaction. J. Res. Math. Ed. 1: 19-28; Jan. 1970.

The need for a theory of instruction, for aptitude-treatment-interaction research, and for training researchers is discussed.

Burns, Paul C. and Davis, Arnold R. Early Research Contributions to Elementary School Mathematics. Arith. Teach. 17: 61-65; Jan. 1970.

Thirty-four "pioneer" studies published between 1919 and 1947 are briefly presented.

King, Bruce W. On Scrambling Instructional Stimuli. J. Res. Math. Ed. 1: 233-240; Nov. 1970.

Research suggests that varying highly refined sequences of instructional stimuli does not make much difference in effectiveness of instruction, as long as concept order is preserved; 19 references are cited. (elementary - college)

Mangrum, Charles T., II and Knight, Carlton W., II. Doctoral Dissertation Research in Science and Mathematics Reported for Volume 28 of Dissertation Abstracts. Sch. Sci. Math. 70: 37-62; Jan. 1970.

For July 1967 - June 1968, 55 dissertations pertaining to elementary school mathematics and 19 to teacher education are included.

Noffsinger, Thomas and Dobbs, Virginia. Teaching Arithmetic to Educable Mentally Retarded Children (Review). J. Ed. Res. 64: 177-184; Dec. 1970.

Research in eight areas of interest is summarized: general characteristics, concept formation, organicity implications, MA and computation, learning processes, motivation, special programs, and programmed instruction; 92 references are listed.

Riedesel, C. Alan. Recent Research Contributions to Elementary School Mathematics. Arith. Teach. 17: 245-252; Mar. 1970.

One hundred seventeen studies published between 1942 and 1968 are cited.

Science and Math Education Information Report: Research Reporting Sections, National Council of Teachers of Mathematics, Forty-eighth Annual Meeting. Columbus, OH: SMAC/Science and Mathematics Education Information Analysis Center; 1970. ED 036 630. MF and HC available from EDRS, 69p.

Eighteen reports are abstracted.

Suydam, Marilyn N. Research on Mathematics Education, Grades K-8, for 1969. Arith. Teach. 17: 511-527; Oct. 1970.

Sixteen summaries, 63 articles, and 122 dissertations are listed, with brief annotations.

Suydam, Marilyn N. and Weaver, J. Fred. Using Research: A Key to Elementary School Mathematics. University Park, PA: The Pennsylvania State University; 1970. ED 043 508. MF and HC available from EDRS, 179p.

A set of eleven bulletins synthesizing research on attitudes, planning for instruction and for research, the teaching-learning process, individualizing instruction, materials, whole number operations, rational numbers, other mathematical topics, and verbal problem solving, are included.

Weaver, J. F. (Editor). Investigations in Mathematics Education. Stanford, CA: School Mathematics Study Group; Jan. 1970.

Abstracts and critiques of 27 published research reports, a list of 106 doctoral theses, and a list of 58 other briefly annotated references are included.

II. Articles

Ahr, Paul R. and Youniss, James. Reasons for Failure on the Class Inclusion Problem. Child Develop. 41: 131-143; Mar. 1970.

At age 10, but not at 6 or 8, children responded correctly to a class-inclusion problem in which they identified "more" or "fewer". However, after correction training all succeeded, indicating proper referencing of words with pictorial symbols, while comprehension of the inclusion relation was independent. (CA 6, 8, 10; 60 pupils)

Anastasiow, Nicholas J.; Sibley, Sally A.; Leonhardt, Teresa M.; and Borich, Gary D. A Comparison of Guided Discovery, Discovery and Didactic Teaching of Math to Kindergarten Poverty Children. Am. Ed. Res. J. 7: 493-510; Nov. 1970.

The rule-example method may be most efficient for mastery of simple classification tasks, while guided discovery appears to be more efficient for mastery of more complex classification tasks. Those with low scores on a picture vocabulary test learned best with the rule-example method, while others did well under either treatment. (grade K; 41 pupils)

Austin, John C. Mental Mathematics Counts. Arith. Teach. 17: 337-338; Apr. 1970.

When students spent one period a week on mental computation, standardized test scores were found to be significantly higher than those of students not given systematic instruction in mental computation. (grades 7, 8; 400 pupils)

Bachman, Alfred Morry. The Relationship Between a Seventh-Grade Pupil's Academic Self-Concept and Achievement in Mathematics. J. Res. Math. Ed. 1: 173-179; May 1970.

General self-concept and self-concept in mathematics were each found to be significantly related to mathematics achievement, with mathematics self-concept related significantly more to such achievement than was general self-concept. (grade 7; 408 pupils)

Baker, Nancy E. and Sullivan, Edmund V. The Influence of Some Task Variables and of Socioeconomic Class on the Manifestation of Conservation of Number. J. Genet. Psychol. 116: 21-30; Mar. 1970.

Conservation appears to be more likely to occur with high interest than low interest materials, and with smaller aggregate sizes. It was manifested significantly more often by middle-class than by lower-class girls, with no difference for boys. A positive correlation was found between performance on conservation and addition/subtraction tasks. (grade K; 156 pupils)

Beckmann, Milton William. Eighth Grade Mathematical Competence - 15 Years Ago and Now. Arith. Teach. 17: 334-335; Apr. 1970.

Mean score on a 109-item test was 45.7 in 1951, and 54.9 in 1965; difference is statistically significant. (grade 9; 1951 - 1,296 students, 1965 - 1,385 students)

Behr, Merlyn J. Interactions Between "Structure-of-Intellect" Factors and Two Methods of Presenting Concepts of Modular Arithmetic - A Summary Paper. J. Res. Math. Ed. 1: 29-42; Jan. 1970.

Significant interactions were found between method of instruction and a figural factor on the time criterion; between method and three semantic factors on learning and retention criteria; and between method and another semantic factor on the time criterion. (college [elem. ed.]; 228 students)

Bierden, James E. Behavioral Objectives and Flexible Grouping in Elementary School Mathematics. J. Res. Math. Ed. 1: 207-217; Nov. 1970.

An intra-class grouping plan using instruction and independent work for individualized objectives resulted in significant gains in computational skills, concept knowledge, and attitude, with a reduction in anxiety. (grade 7; 44 pupils)

Boersma, Frederic; Wilton, Keri; Barham, Richard; and Muir, Walter. Effects of Arithmetic Problem Difficulty on Pupillary Dilation in Normals and Educable Retardates. J. Exp. Child Psychol. 9: 142-155; Apr. 1970.

Mean change in dilation increased as a function of time and of difficulty; significant differences were observed as a function of time. (EMR's [CA 10, 11]; 20 pupils)

Brager, Gary L. Teacher Expectancy and Mathematics Achievement. J. Res. Math. Ed. 1: 88-94; Mar. 1970.

There were no significant differences found for pupils whose teachers were given positive, negative, or neutral biases toward the programmed materials being used. (grade 4; 363 pupils)

Crawford, Alan N. A Pilot Study of Computer-Assisted Drill and Practice in Seventh Grade Remedial Mathematics. Calif. J. Ed. Res. 21: 170-181; Sept. 1970.

Pupils who had 3-15 minutes of extra computational practice per day gained significantly from pre- to post-test; however, scores were not significantly different from those of a group with no extra practice. (grade 7; 30 pupils)

Daehler, Marvin W. Children's Manipulation of Illusory and Ambiguous Stimuli, Discriminative Performance, and Implications for Conceptual Development. Child Develop. 41: 225-241; Mar. 1970.

Six-year-olds spontaneously produced significantly more investigatory responses and correct discrimination; however, younger children were trained to do so. Spontaneous performance was found not to be related to conservation of length. (ages 4-5 to 6-5; 160 pupils)

Darnell, C. D. and Bourne, L. E., Jr. Effects of Age, Verbal Ability, and Pretraining with Component Concepts on the Performance of Children in a Bidimensional Classification Task. J. Ed. Psychol. 61: 66-71; Feb. 1970.

Older and more verbal children benefited more from pretraining on relevant dimensions in ordering objects than did younger and less verbal children. (grades K, 2; 112 pupils)

Diedrich, Richard C. and Glennon, Vincent J. The Effects of Studying Decimal and Nondecimal Numeration Systems on Mathematical Understanding, Retention, and Transfer. J. Res. Math. Ed. 1: 162-172; May 1970.

Study of the decimal system alone is as effective as study of nondecimal systems in promoting understanding of the decimal system of numeration, but understanding of a place-value system in general is increased by study of nondecimal systems. (grade 4; 4 classes)

Elkind, David; Anagnostopoulou, Rena; and Malone, Susan. Determinants of Part-Whole Perception in Children. Child Develop. 41: 391-397; June 1970.

Pupils who scored higher on the part-whole test also scored significantly higher than the low scorers on reconstruction, description, and logic/addition tasks. (grade 1; 40 pupils)

Fischbein, Efraim; Pampu, Ileana; and Manzat, Ion. Comparison of Ratios and the Chance Concept in Children. Child Develop. 41: 377-389; June 1970.

After brief instruction, third-graders were able to make correct decisions, as did sixth graders, through "a comparison of quantitative ratios". (preschool, grades 3, 6; 180 pupils)

Fletcher, Robert F. An Investigation of the Effect of an Operationally Defined Word on Conservation-of-Number Responses. Arith. Teach. 17: 255-261; Mar. 1970.

Pupils who were given a conservation of number test in which a coined word (which had been taught to all pupils) was used achieved slightly better than a group with whom usual conservation terms were used. (grade 1; 200 pupils)

Fogelman, K. R. Piagetian Tests and Sex Differences - II. Ed. Res. 12: 154-155; Feb. 1970.

Boys demonstrated conservation more frequently using an "active" procedure, in which they manipulated the material, while girls did better using the "passive" procedure, in which they watched the experimenter manipulate it. (ages 6, 7; 172 pupils)

Ford, Leroy H., Jr. Predictive Versus Perceptual Responses to Piaget's Water-Line Task and Their Relation to Distance Conservation. Child Develop. 41: 193-204; Mar. 1970.

Results were largely consistent with Piaget's hypothesis that correct water-line performance presupposes distance conservation; however, perception was significantly easier than prediction. (preschool; 20 pupils)

Foster, John. An Exploratory Attempt to Assess Creative Ability in Mathematics. Primary Math. 8: 2-7; Apr. 1970.

Two tests were developed, one in which children identified sets of six cards and one in which examples were developed from specified numerals and symbols. Reliability of each was high (.88, .85), while correlation was low (.31), indicating they measured different aspects of "creativity". (ages 9-11; 265 pupils)

Gibney, Thomas C.; Ginther, John L.; and Pigge, Fred. The Mathematical Understandings of Preservice and In-Service Teachers. Arith. Teach. 17: 155-162; Feb. 1970.

On a 65-item test (K-R 21 reliability of .80), pre-service teachers scored significantly higher, with significant differences generally on subtests for "modern" topics. Significant differences were found in favor of pre-service teachers in grades 1-4, while for in-service teachers, the higher the grade level, the higher the mean score. (pre- and in-service teachers; 887 pre-, 177 in-service [1,064])

Gibney, Thomas C.; Ginther, John L; and Pigge, Fred L. What Influences the Mathematical Understanding of Elementary School Teachers? El. Sch. J. 70: 367-372; Apr. 1970.

No significant differences among teachers grouped by size of community in which they desired to teach or were teaching were found. The mean score of those who preferred to teach mathematics was significantly greater than scores of those who preferred language arts, science, or social science; those who preferred mathematics least scored significantly lower. (pre- and in-service teachers; 1,077 teachers)

Gibney, Thomas C.; Ginther, John L.; and Pigge, Fred L. A Comparison of the Number of Mathematics Courses Taken by Elementary Teachers and Their Mathematical Understandings. Sch. Sci. Math. 70: 377-381; May 1970.

As the amount of mathematics in high school, college, and on modern topics increased, scores increased. (teachers; 1,050 teachers)

Goolsby, Thomas M., Jr. and Frary, Robert B. Effect of Massive Educational Intervention on Achievement of First Grade Students. J. Exp. Ed. 39: 46-52; Fall 1970.

Use of experimental materials designed "to promote readiness and enhance the curriculum" for disadvantaged students resulted in significantly greater achievement than that attained by students using conventional materials. (grade 1; 200 pupils)

Grafft, William. A Study of Behavioral Performances Within the Structure of Multiplication. Arith. Teach. 17: 335-337; Apr. 1970.

Nine structural components of multiplication were identified. Children were interviewed to ascertain their ability on each, and "it seems that categorized responses can be useful". (grade 6; 482 pupils)

Halford, G. S. and Fullerton, T. J. A Discrimination Task Which Induces Conservation of Number. Child Develop. 41: 205-213; Mar. 1970.

Eight of 12 non-conservers attained conservation when trained with a standard-set matching task, while only one of 12 untrained non-conservers attained it. (age 6; 24 pupils)

Harris, Lauren; Schaller, M. Joseph; and Mitler, Merrill M. The Effects of Stimulus Type on Performance in a Color-Form Sorting Task with Preschool, Kindergarten, First-Grade, and Third-Grade Children. Child Develop. 41: 177-191; Mar. 1970.

Across age groups, form matches were most frequent for geometric figures, followed by animal outlines and "scrambled" figures, though differences were small. Preference and strength of it increased significantly with age. (preschool, grades K, 1, 3; 100 pupils)

Heard, Ida Mae. Mathematical Concepts and Abilities Possessed by Kindergarten Entrants. Arith. Teach. 17: 340-341; Apr. 1970.

In the first year of a seven-year longitudinal study, 25 children were individually tested. No significant differences were found between the performance of boys and girls, or those who had or had not attended nursery school. (grade K; 25 pupils)

Heitzman, Andrew J. Effects of a Token Reinforcement System on the Reading and Arithmetic Skills Learnings of Migrant Primary School Pupils. J. Ed. Res. 63: 455-458; July/Aug. 1970.

A group who received plastic tokens (exchangeable for toys, candy, etc.) to reward skills learning responses achieved significantly higher scores on a skills test than those attained by a group not receiving tokens. (ages 6-6 to 9-6; 60 pupils)

Higgins, Jon L. Attitude Changes in a Mathematics Laboratory Utilizing a Mathematics-Through-Science Approach. J. Res. Math. Ed. 1: 43-56; Jan. 1970.

Significant differences were found on six attitude scales after instruction in a laboratory setting. When data were analyzed in terms of naturally occuring attitude groups, no significant relationship to achievement was found. (grade 8; 29 classes)

Hillman, Bill W. The Effect of Knowledge of Results and Token Reinforcement on the Arithmetic Achievement of Elementary School Children. Arith. Teach. 17: 676-682; Dec. 1970.

Pupils given per-item knowledge of results, either with or without candy reinforcement, scored significantly higher than pupils given knowledge of results 24 hours later. Low achievers may profit more than high achievers. (grade 5; 101 pupils)

Jerman, Max. Some Strategies for Solving Simple Multiplication Combinations. J. Res. Math. Ed. 1: 95-128; Mar. 1970.

Process models were tested with data from children using CAI. They appear to use different strategies for different combinations, and the strategy used may be a function of the combination itself. Strategies used in grade 3 appear to be the ones used for the same combinations in grade 6 in 72 per cent of the cases. (grades 3-6; 132 pupils, 325 pupils)

Kaess, Dale W. Form Constancy and the Perceptual Task: A Developmental Study. J. Exp. Psychol. 83: 465-471; Mar. 1970.

Ability to identify rectangular shapes, rotated in the third dimension, by physical or perspective shape was significantly different at different ages. (ages 8, 13, 18; 120 pupils)

Kaplan, Jerome D. An Example of a Mathematics Instructional Program for Disadvantaged Children. Arith. Teach. 17: 332-334; Apr. 1970.

Six pupils who used programmed material on addition and subtraction with zero increased their scores 45 per cent. (grade 1; 6 pupils)

Karplus, Elizabeth F. and Karplus, Robert. Intellectual Development Beyond Elementary School; I. Deductive Logic. Sch. Sci. Math. 70: 398-406; May 1970.

Responses to a logic puzzle were placed in six categories, with progress from "pre-logical" to "abstract logic" explanations evident as grade level increased; however, adults progressed little further. Only 10 per cent of answers were correct at concrete levels; 60 per cent, at abstract levels. (grades 5-12, adult; 449 pupils)

Karplus, Robert and Peterson, Rita W. Intellectual Development Beyond Elementary School; II. Ratio, A Survey. Sch. Sci. Math. 70: 813-820; Dec. 1970.

Responses were placed in seven categories, with variations for grade level and suburban-urban location noted. Many twelfth graders could not do proportional reasoning. (ages 9-18 [grades 4-12]; 727 pupils)

Keislar, Evan R. and Stern, Carolyn. Differentiated Instruction in Problem Solving for Children of Different Mental Ability Levels. J. Ed. Psychol. 61: 445-450; Dec. 1970.

Children in the high-MA group who were taught a complex strategy ("hypothesis testing") were superior to those taught a simple strategy ("gambler's"); the reverse was true with the low-MA group. (grades 2, 3; 82 pupils)

Koppitz, Elizabeth Munsterberg. The Visual Aural Digit Span Test with Elementary School Children. J. Clin. Psychol. 26: 349-353; July 1970.

No significant relationship was found between scores and sex or IQ. Older pupils did consistently better, and visual presentation of digits resulted in better recall than did aural presentation. (grades 1-5 [ages 6 1/2-11]; 100 pupils)

Larsen, Gary Y. and Flavell, John H. Verbal Factors in Compensation Performance and the Relation Between Conservation and Compensation. Child Develop. 41: 965-977; Dec. 1970.

Less abstract terms significantly facilitated compensation performance only for wider containers. No clear evidence that compensation precedes or accompanies conservation of length was found. (grades K, 2; 112 pupils)

Lessing, Elise E.; Zagorin, Susan W.; and Nelson, Dorothy. WISC Subtest and IQ Score Correlates of Father Absence. J. Genet. Psychol. 117: 181-195; Dec. 1970.

A history of prolonged father absence was associated with lower scores on arithmetic subtests for boys. (ages 9-15; 433 pupils)

Lewis, Marian. Teaching Arithmetic Computation Skills. Ed. Vis. Handicapped 2: 66-72; Oct. 1970.

A survey of the computational aids used in classes for the visually handicapped is reported. (elementary, secondary; 74 questionnaires)

Lister, Caroline M. The Development of a Concept of Volume Conservation in ESN Children. Brit. J. Ed. Psychol. 40: 55-64; Feb. 1970.

A volume conservation concept was taught to retarded pupils, who generalized this understanding to weight and substance situations. (ages 9-15 [IQ 46-75]; 30 pupils)

Litwiller, Bonnie H. Enrichment: A Method of Changing the Attitudes of Prospective Elementary Teachers Toward Mathematics. Sch. Sci. Math. 70: 345-350; Apr. 1970.

Attitudes of students who were given an enrichment problem each day became more positive, while students in regular classes showed no attitude change. (pre-service teachers; 145 students)

MacKay, C. K.; Fraser, Joan; and Ross, Isabel. Matrices, Three by Three: Classification and Seriation. Child Develop. 41: 787-797; Sept. 1970.

A developmental lag was found between emergence of the ability for cross-classification and that for double seriation. (ages 5-8; 90 pupils, 48 pupils)

McFie, J. and Thompson, J. A. Intellectual Abilities of Immigrant Children. Brit. J. Ed. Psychol. 40: 348-351; Nov. 1970.

Teaching with constructional and geometrical material appeared at least as important as language teaching. (ages 5-15; 61 pupils)

McManis, Donald L. Conservation, Seriation, and Transitivity Performance by Retarded and Average Individuals. Am. J. Ment. Def. 74: 784-791; May 1970.

Among pupils showing discrepant performance in (1) conservation and seriation or (2) seriation and transitivity, significantly more had acquired conservation without seriation, or seriation without transitivity. Significantly fewer retarded than average subjects had seriation ability. (elementary; 160 pupils)

Murray, Frank B. Verbal and Nonverbal Assessment of the Conservation of Illusion-Distorted Length. J. Res. Math. Ed. 1: 9-18; Jan. 1970.

Significantly more conservation responses were found with a verbal procedure, and significantly fewer conservation responses with a nonverbal procedure. Conservation appears to involve many gradations. (grades K, 1 [ages 5-7]; 37 pupils)

Murray, Frank B. Stimulus Mode and the Conservation of Weight and Number. J. Ed. Psychol. 61: 287-291; Aug. 1970.

The proportions of conservers and non-conservers were not significantly different when objects were presented in concrete form in photographs, in drawings, or verbally described. (grades K-2; 113 pupils)

Neale, Daniel C.; Gill, Noel; and Tismer, Werner. Relationship Between Attitudes Toward School Subjects and School Achievement. J. Ed. Res. 63: 232-237; Jan. 1970.

Attitudes and arithmetic achievement were found to be significantly correlated (.23, .27) only for boys.

Neimark, Edith D. and Slotnick, Nan S. Development of the Understanding of Logical Connectives. J. Ed. Psychol. 61: 451-460; Dec. 1970.

Inclusion and exclusion were understood by a majority of even the youngest children. Intersection was understood by a majority of all but the youngest children, while union was not understood by the majority except at the college level. (grades 3-9, college sophomores; 513 pupils)

Nicodemus, Robert B. Order of Complexity in Attribute Blocks. Sch. Sci. Math. 70: 649-654; Oct. 1970.

Performance of complex behaviors was facilitated by experience with simpler subordinate behaviors. (grade 5; 46 pupils)

Nolan, J. Dennis and Pendarvis, Leah V. Effects of Variable-Irrelevant Dimensions on the Discrimination Reversal Learning of Nursery School Children. J. Exp. Psychol. 86: 428-433; Dec. 1970.

Size problems were learned more readily than form problems, and form more readily than color problems. With two irrelevant dimensions rather than one, size problems were still learned quickly, while form and color problems were more difficult, though reversals were facilitated. (nursery school; 60 pupils)

Overbeck, Carla and Schwartz, Marian. Training in Conservation of Weight. J. Exp. Child Psychol. 9: 253-264; Apr. 1970.

Reinforcement facilitated acquisition of conservation of weight, but active participation had no effect. (ages 5-8; 48 pupils)

Peisach, Estelle and Wein, Norman. Relationship of Conservation Explanations to Item Difficulty. J. Genet. Psychol. 117: 167-180; Dec. 1970.

Changes in response relative to difficulty level of items indicated that inability to express reasons for conservation is not merely a function of verbal skills, but is reflective of a lower level of conservation conceptualization. (grades K-2; 180 pupils)

Peper, John B. and Chansky, Norman M. Esteem and Achievement in Arithmetic. El. Sch. J. 70: 284-288; Feb. 1970.

Rankings in achievement made by a pupil, his peer group, and his teacher were related to actual achievement, with teacher rankings more highly correlated with other rankings in June than in February (and thus influential). (grade 5; 24 pupils)

Peters, Donald L. Discovery Learning in Kindergarten Mathematics. J. Res. Math. Ed. 1: 76-87; Mar. 1970.

An expository verbal procedure was more effective on immediate learning of conservation than were two discovery-oriented procedures, with guided discovery and verbal procedures both effective for retention. No differences for transfer were found between procedures. (grade K; 120 pupils)

Peters, Donald L. Verbal Mediators and Cue Discrimination in the Transition from Nonconservation to Conservation of Number. Child Develop. 41: 707-721; Sept. 1970.

Verbal training facilitated the change to conservation more than non-cued, visual-cued, or no training on immediate learning, and both verbal and visual-cued training were significantly better on delayed retention. Language level and analytic sorting behavior were both reliable predictors, while visual-cued training benefited those high in language and verbal training benefited analytic pupils. (grade K; 131 pupils)

Rea, Robert E. and Reys, Robert E. Mathematical Competencies of Entering Kindergarteners. Arith. Teach. 17: 65-74; Jan. 1970.

About 37 per cent could count to or beyond 20 both by rote and rationally; slightly more than 50 per cent could count beyond 14; and more than 75 per cent, beyond 10. Differences due to age, previous education, other siblings, parents' education, father's occupation, and sex are presented. (grade K; 727 pupils)

Rea, Robert E. and Reys, Robert E. The Comprehensive Mathematics Inventory: An Experimental Instrument for Assessing Youngsters Entering School. J. Ed. Meas. 7: 45-47; Spring 1970.

A 200-item test was developed, with subtests on money, vocabulary and number (Part I), and geometry, pattern identification, measurement and recall (Part II). Reliability of Part I was .91 to .94; Part II, .83 to .87. (grade K; 727 pupils)

Reys, Robert E. and Rea, Robert E. The Comprehensive Mathematics Inventory: An Experimental Instrument for Assessing the Mathematical Competencies of Children Entering School. J. Res. Math. Ed. 1: 180-185; May 1970.

A 200-item test, with reliabilities from .83 to .94 for subtests, was developed. Intercorrelations ranged from .25 to .93; 87 per cent of the variance could be accounted for by the number subtest. (grade K; 727 pupils)

Roll, Samuel. Reversibility Training and Stimulus Desirability as Factors in Conservation of Number. Child Develop. 41: 501-507; June 1970.

Reversibility training resulted in a significant increase in conservation responding, but not in increased verbalization of conservation principles. Use of candies or paper chips did not affect conservation. (grade K; 100 pupils)

Ross, Dorothea. Incidental Learning of Number Concepts in Small Group Games. Am. J. Ment. Def. 74: 718-725; May 1970.

Retarded pupils using a game program for nine months improved significantly more than a group using a regular special-class program in knowledge of basic number concepts and in general game skills. Response behaviors and attitudes also changed. (EMR's, ages 4-10 [MA 3-7]; 40 pupils)

Schaeffer, Benson and Ellis, Stephen. The Effects of Overlearning on Children's Nonreversal and Reversal Learning Using Unrelated Stimuli. J. Exp. Child Psychol. 10: 1-7; Aug. 1970.

Nonreversal shifts were easier than reversal shifts, but not after "overlearning". (ages 7-9 [grades 2-4]; 68 pupils, 106 pupils)

Schwartz, Marilyn Miller and Scholnick, Ellin Kofsky. Scalogram Analysis of Logical and Perceptual Components of Conservation of Discontinuous Quantity. Child Develop. 41: 695-705; Sept. 1970.

The easiest tasks involved identical containers. Significant interaction was found between stimulus setting and judgments; when two containers differed, identity was easiest followed by equivalence and comparison judgments. (ages 4-6; 40 pupils)

Shapiro, Bernard J. and O'Brien, Thomas C. Logical Thinking in Children Ages Six Through Thirteen. Child Develop. 41: 823-829; Sept. 1970.

Ability to recognize logical necessity was significantly easier than ability to test for it, at all age levels. Recognition "leveled off" high at 6-8 years, while testing continued to increase over the eight years, with no "leveling off" evident. (ages 6-13; 48 pupils)

Shepler, Jack Lee. Parts of a Systems Approach to the Development of a Unit in Probability and Statistics for the Elementary School. J. Res. Math. Ed. 1: 197-205; Nov. 1970.

Students satisfactorily learned 11 of 14 objectives, with instruction developed on the basis of task analysis. (grade 6; 25 pupils)

Siegel, Alexander W. and McBurney, Donald H. Estimation of Line Length and Number: A Developmental Study. J. Exp. Child Psychol. 10: 170-180; Oct. 1970.

Children were able to match handgrip force to their perception of length of lines and verbally-presented numbers as reliably as adults. The technique may be used to assess perceptual and cognitive skills. (ages 6-13, adult; 96 pupils, 16 adults)

Sparks, Billie Earl; Brown, Julia Ann; and Bassler, Otto C. The Feasibility of Inducing Number Conservation Through Training on Reversibility. J. Res. Math. Ed. 1: 134-143; May 1970.

Reversibility training induced conservation in five-year-olds who were on the threshold of achieving conservation, though its permanence is doubtful. The inductive training did not induce conservation in four-year-olds. (nursery school, grade K; 28 pupils)

Steffe, Leslie P. Differential Performance of First-Grade Children When Solving Arithmetic Addition Problems. J. Res. Math. Ed. 1: 144-161; May 1970.

Children who failed on a test of quantitative comparisons performed significantly lower on a test of addition problems. Problems with no accompanying aids were significantly more difficult than either of two other types of problems. Problems with a described transformation were significantly easier than those without it. (grade 1; 341 pupils)

Strauss, Sidney and Langer, Jonas. Operational Thought Inducement. Child Develop. 41: 163-175; Mar. 1970.

Screening misleading cues did not induce conservation; those in a transitional phase were more likely to conserve and change progressively. (ages 5-8; 105 pupils)

Suppes, Patrick and Ihrke, Constance. Accelerated Program in Elementary-School Mathematics - The Fourth Year. Psychol. in Sch. 7: 111-126; June 1970.

Program information and data for pupils using texts on sets, number, and probability, and CAI programs on drill, logic, and algebra during 1966-67, are presented and discussed. (grade 4; 30 pupils)

Tagatz, Glenn E.; Layman, Jane A.; and Needham, James R. Information Processing of Third and Fourth Grade Children. Contem. Ed. 42: 31-34; Oct. 1970.

In the processing of positive versus negative information on a card-matching task, a significant difference was found for grade level, but not for sex, SES, or point of presenting information. (grades 3, 4; 40 pupils)

Trueblood, Cecil R. A Comparison of Two Techniques for Using Visual-Tactual Devices to Teach Exponents and Nondecimal Bases in Elementary School Mathematics. Arith. Teach. 17: 338-340; Apr. 1970.

Pupils who watched the teacher manipulate materials scored higher on the posttest than pupils who manipulated materials themselves. Both methods resulted in a high degree of retention. (grade 4; 7 classes)

Uprichard, A. Edward. The Effect of Sequence in the Acquisition of Three Set Relations; An Experiment with Preschoolers. Arith. Teach. 17: 597-604; Nov. 1970.

Teaching "equivalence", "greater than", and "less than" in that order appeared to be the most efficient sequence for sets with 3 through 6 members. "Equivalence" seemed necessary before understanding of the other two developed. (preschool; 32 children)

Verizzo, Ouida. Conceptions of Conservation and Reversibility in Children of Very Superior Intelligence. Sch. Sci. Math. 70: 31-36; Jan. 1970.

A substantial percentage of the gifted children tested made abstract conceptions of conservation and reversibility at an earlier age than children in general. Where conservation was not evident, confusion of the words mass, weight, and volume existed. (grades 3-8 [ages 7-14]; 140 pupils)

Very, Philip S. and Iacono, Carmine H. Differential Factor Structure of Seventh Grade Students. J. Genet. Psychol. 117: 239-251; Dec. 1970.

Analysis of data from a test battery revealed that numerical facility and perceptual speed were found to be a single factor at this age level. No inductive reasoning factor was present for girls, nor was symbolic reasoning or estimative ability found for boys. Arithmetic reasoning was found as predicted, but general reasoning was not. (grade 7; 203 pupils)

Wright, R. E. Something Old, Something New. Sch. Sci. Math. 70: 707-712; Nov. 1970.

There were no significant differences in gains between those using a traditional and two modern programs in learning traditional concepts, but those in the modern programs achieved higher scores on a test of modern concepts. (grade 8; 225 pupils)

III. Dissertation Abstracts

Ackerman, Arthur Peter. The Effect of Pupil Tutors on Arithmetic Achievement of Third-Grade Students. (University of Oregon, 1969.) Dis. Abst. 31A: 918; Sept. 1970.

The use of either low- or high-achieving sixth graders as tutors for low-achieving third graders resulted in significantly higher achievement scores than for those in control groups. (grades 3, 6; 42 pupils)

Aldrich, Byron Vinson. A Study of Classification and Piaget's Theory of Concrete Operations. (The University of Michigan, 1970.) Dis. Abst. 31A: 2164-2165; Nov. 1970.

About 29 per cent of the children given direct verbal training on quantification of inclusion were able to maintain a high level of classifying, but the skill appeared to be isolated rather than a concrete operational structure. There was little transfer or consistency between tests. (grade K; 57 pupils)

Anderson, Richard Mark. A Study of Cadet Teaching as a Method to Improve the Multiplication and Division Proficiency of a Selected Sample of Junior High School Students. (The University of Iowa, 1970.) Dis. Abst. 31A: 2782; Dec. 1970.

Junior high students who received special instruction in multiplication and division skills achieved significant gains in proficiency in those skills whether or not they tutored fifth graders in those skills. Tutored fifth graders achieved as well as those untutored. (junior high, grade 5)

Asbury, Charles Alexander. Factors Associated with Discrepant Achievement in Rural Economically Deprived White and Negro First Graders. (University of North Carolina at Chapel Hill, 1969.) Dis. Abst. 31A: 208-209; July 1970.

Arithmetic overachievers were superior to underachievers on subtests measuring numerical and sensory concept activation. Girls were superior to boys on subtests of perception and association vocabulary, but there were no race differences. (grade 1; 225 pupils)

Axton, Charles B., II. The Use of Previously Learned Mathematics Concepts to Introduce Concepts of Rhythm Notation to Third-Grade Children. (University of Kansas, 1969.) Dis. Abst. 30A: 3036; Jan. 1970.

Pupils taught rhythm notation by relating it to learned mathematical concepts scored significantly higher on music recognition and performance tests than did the control group. (grade 3; 50 pupils)

Backman, Carl Adolph. A Study of Teacher Characteristics Related to Teaching Geometry in the Elementary School. (Syracuse University, 1969.) Dis. Abst. 31A: 258-259; July 1970.

Teachers answered correctly approximately 45 per cent of the items on geometry and teaching geometry tests. Attitudes toward geometry were slightly favorable. (in-service teachers [grades K-8]; 65 teachers)

Bailey, Howard Lloyd. A Study of the Competence in Geometry of Undergraduate Elementary Education Majors. (Colorado State College, 1969.) Dis. Abst. 30A: 4297-4298; Apr. 1970.

Seventy per cent of the students scored 70 per cent or less on a geometry test based on content from children's texts. Those who had a high school geometry course or a specific mathematics content course scored higher than those who did not have such a course. (pre-service teachers; 183 students)

Barragy, Sister Micheleen. The Effect of Varying Object Arrangement and Number on Children's Ability to Coordinate Perspectives. (George Peabody College for Teachers, 1970.) Dis. Abst. 31A: 2730; Dec. 1970.

The number of objects and the type of arrangement had no measurable effect on the difficulty level of the coordination of perspective task, although there were significant age differences in performance. (grades K, 3, 6; 60 pupils)

Beamer, Robert Harlan. Transfer After Training with Single vs. Multiple Tasks by Individuals and Pairs of Low and High Ability Fifth Graders. (Illinois State University, 1970.) Dis. Abst. 31A: 2730; Dec. 1970.

Students who worked in pairs to multiply fractions achieved more when a single method was taught, while those who worked individually achieved more when three or five methods were used. (No findings related to ability were presented, except that intelligence was significant.) (grade 4; 96 pupils)

Beattie, Ian David. The Effects of Supplementary Programmed Instruction in Mathematics on the Mathematical Attitudes and Abilities of Prospective Teachers. (Southern Illinois University, 1969.) Dis. Abst. 30A: 3343; Feb. 1970.

Those who studied six programmed units supplementing a methods course achieved significantly higher scores than those who took only the course. Attitudes improved significantly for both groups, but were not significantly different between the groups. (pre-service teachers; 128 students)

Beeson, Richard O'Neil, Jr. Immediate Knowledge of Results and Test Performance. (University of Arkansas, 1970.) Dis. Abst. 31A: 920; Sept. 1970.

There were no significant differences in the results of ten tests given with immediate or delayed knowledge of results, but immediate knowledge was significantly better on the final test. Test anxiety, attitude, and aspiration contributed most to prediction of test performance. (college, grade 8)

Begum, Kamrunnessa. The Construction of Objective Achievement Tests in Arithmetic for Classes One Through Five in Bengali Medium Schools in Dacca, Pakistan. (Colorado State College, 1969.) Dis. Abst. 30A: 4299-4300; Apr. 1970.

Reliability on the five tests ranged from .80 to .92. Ranges, means, and other data are cited; boys tended to have a higher mean score than girls did. (grades 1-5; 1,913 pupils)

Biot, John James. A Study of the Relationship Between Children's Ability to Conserve Area and Their Performance with Common Fractions at Age Six and Seven. (New York University, 1970.) Dis. Abst. 31B: 2810-2811; Nov. 1970.

Children's ability to conserve area was higher than their ability to subdivide an area into a specific number of equivalent parts. (ages 6, 7; 144 pupils)

Bolduc, Elroy Joseph, Jr. A Factorial Study of the Effects of Three Variables on the Ability of First-Grade Children to Solve Arithmetic Addition Problems. (The University of Tennessee, 1969.) Dis. Abst. 30A: 3358; Feb. 1970.

No significant differences were found for position of the question or use of like elements in sets, but problems presented without a visual aid were more difficult than those with a visual aid. (grade 1; 36 pupils)

Bonney, Lewis Alfred. Relationships Between Content Experience and the Development of Seriation Skills in First Grade Children. (University of Arizona, 1970.) Dis. Abst. 31A: 2167; Nov. 1970.

Seriation skills were not generalized across content categories. Content relevant instruction may alter the extent of generalization. (grade 1; 65 pupils)

Boonstra, Paul Henry. A Pilot Project for the Investigation of the Effects of a Mathematics Laboratory Experience: A Case Study. (Michigan State University, 1970.) Dis. Abst. 31A: 2225; Nov. 1970.

Two laboratory experiences were not sufficient to affect teaching behavior: they did not result in the use of manipulative materials nor affect the teacher-centeredness of classrooms. (pre-service teachers; 1 class)

Bowen, James Joseph. The Use of Games as an Instructional Media. (University of California, Los Angeles, 1969.) Dis. Abst. 30A: 3358-3359; Feb. 1970.

Bright students who used logic games had significantly higher gain scores than those who used a textbook to study logic. (grade 4; 3 classes)

Boyden, Joanne Marie. Construction of a Diagnostic Test in Verbal Arithmetic Problem Solving at the Fifth Grade Level. (University of Miami, 1970.) Dis. Abst. 31A: 1504; Oct. 1970.

Incorrect responses were used as alternative answers on diagnostic test items, with 12 error categories forming the basis for a matrix which was found to diagnose "satisfactorily". (grade 5)

Bracht, Glenn Herbert. The Relationship of Treatment Tasks, Personological Variables, and Dependent Variables to Aptitude-Treatment Interactions. (University of Colorado, 1969.) Dis. Abst. 30A: 4268; Apr. 1970.

A three-way interaction was obtained between spatial and verbal treatments (with self-instructional materials on addition of integers) and ability groups defined by scores on tests of spatial and verbal ability. Pupils with middle or high ability on both tests performed equally well with each treatment, and there was some evidence that the verbal treatment was superior for those with low spatial ability, and the spatial treatment was superior for those with low verbal ability. (grade 6)

Bramwell, John Robertson. Arithmetic Achievement and Recall as a Function of Interpolated Activity in the Inter-Response Interval and Learner Ability Under Two Conditions of Information Feedback. (University of Oregon, 1970.) Dis. Abst. 31A: 2168; Nov. 1970.

Groups given immediate feedback did not do significantly better than those for whom feedback was delayed, though ability level affected scores. (grade 6; 84 pupils)

Braswell, James Sidney, III. The Formative Evaluation of Patterns in Arithmetic, Grade 6, Using Item Sampling. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 672; Aug. 1970.

The item-sampling technique was found to be effective when applied to formative curriculum development. About 120-130 random responses to an item were sufficient to obtain a useful difficulty level. The quality of the items in the pool is important; they must be sensitive to the objectives. (grade 6; 60 classes)

Brewer, Barbara Anne. Continuous Complex Learning of Preschool Children. (University of Hawaii, 1969.) Dis. Abst. 30A: 4268-4269; Apr. 1970.

Early skills essential for learning such cognitive skills as number were isolated, and children were trained in these skills, with attention and work behaviors maintained by token reinforcement. (preschool [age 4]; 11 children)

Brudenell, Gerald Alfred. Predicting Achievement of Head Start Children Using Personal, Testing, and Rating Data. (Colorado State College, 1969.) Dis. Abst. 30A: 4269; Apr. 1970.

In a study of the predictive ability of 24 variables on achievement in Head Start programs, the arithmetic subtest of the Wechsler Preschool and Primary Scale of Intelligence appeared to be somewhat predictive of "numerical concept activation". (age 5; 74 pupils)

Brumbaugh, Douglas Kent. Isolation of Factors Which Influence the Ability of Young Children to Associate Solids with Representations of Those Solids. (University of Georgia, 1969.) Dis. Abst. 30A: 5335; June 1970.

Children were able to associate a solid with its representations in photographs or sketches, which they classified equally well. The cube and rectangular solid were most difficult, and were mutual distractors, as were the sphere and ellipsoid. (ages 3, 4; 129 children)

Burbank, Irvin Kimball. Relationships Between Parental Attitude Toward Mathematics and Student Attitude Toward Mathematics, and Between Student Attitude Toward Mathematics and Student Achievement in Mathematics. (Utah State University, 1968.) Dis. Abst. 30A: 3359-3360; Feb. 1970.

Both parental attitudes were significantly correlated with students' mathematics attitudes. Students' attitudes correlated with achievement in mathematical reasoning, concepts, computations, and total scores. (grade 7; 411 pupils)

Burdick, Charles Philip. A Study of the Effects of Academic Acceleration on Learning and on Retention of Learning Addition in the Set of Integers. (Syracuse University, 1969.) Dis. Abst. 31A: 54-55; July 1970.

It appeared that grade 6 is the optimal level for teaching addition with integers, since there was the greatest increase in learning from instruction, attainment of group criterion performance, and non-significant loss on the retention test. However, grade 5 had the greatest increase from pre- to retention test. (grades 5-8; 245 pupils)

Burrow, Daniel Alfred. Summer Tutoring: An Investigation of Older Volunteer Students Tutoring Younger Students in Arithmetic Computation. (University of Maryland, 1970.) Dis. Abst. 31A: 2244; Nov. 1970.

Low-achieving pupils from grades 3, 4, and 5 who were tutored by high-achieving pupils from grades 6, 7, and 8 achieved higher gain scores on computational skills than did untutored pupils. (grades 3-8; 72 pupils)

Caezza, John Francis. A Study of Teacher Experience, Knowledge of and Attitude Toward Mathematics and the Relationship of These Variables to Elementary School Pupils' Attitudes Toward and Achievement in Mathematics. (Syracuse University, 1969.) Dis. Abst. 31A: 921-922; Sept. 1970.

Correlations between pupil achievement and pupil or teacher attitude were small. Pupil attitude did not appear affected by language aptitude. Teacher attitude did not appear affected by factors in the teachers' background, nor were pupils affected by level of teacher knowledge of concepts. (grades 2-6; 2,765 pupils, 104 teachers)

Cheatham, Ben H., Jr. A Comparison of Two Methods of Introducing Selected Geometric Concepts to Seventh Grade Students. (The University of Florida, 1969.) Dis. Abst. 31A: 1132; Sept. 1970.

Gains in geometric concepts were not significantly different for those who constructed models with compass and straightedge or with paper-folding techniques. (grade 7; 6 classes)

Cibbarelli, Vincent Charles. An Analysis of the Effect of Teaching Rational Number Concepts and Operations Through Pre-Recorded Magnetic Tape. (The University of Connecticut, 1969.) Dis. Abst. 30A: 3668-3669; Mar. 1970.

Teacher-directed instruction was more effective than use of magnetic tapes for understanding and computation with rational numbers, though the high achievers scored higher on computation taught with tape. (grade 4; 152 pupils)

Cobb, Joseph Arthur. The Relationship of Observable Classroom Behaviors to Achievement of Fourth Grade Pupils. (University of Oregon, 1969.) Dis. Abst. 30A: 3315; Feb. 1970.

Pupils were found to exhibit different rates of observable behaviors and these were significantly correlated with arithmetic achievement. (grade 4; 103 pupils)

Cohen, Louis Sayles. An Investigation of the Effectiveness of Certain Scheduling Procedures on Mathematical Achievement of Junior High School Pupils. (University of Minnesota, 1970.) Dis. Abst. 31A: 1995; Nov. 1970.

No significant differences in achievement were found between groups using a modular curricular plan and an individualized instruction plan. (grade 7; 443 pupils)

Collier, Charles Patrick. The Formal-Informal Dimensions of Attitude Toward Mathematics and Mathematics Instruction of Prospective Elementary Teachers. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 660-661; Aug. 1970.

After one to three courses, high achievers had a more informal view of mathematics than did low achievers, with some variation. Students planning to teach grades K-2 had more formal views of mathematics instruction than those planning to teach grades 3-8. (pre-service teachers)

Cox, Linda Ann Simon. A Study of Pupil Achievement in Mathematics and Teacher Competence in Mathematics. (University of Kansas, 1970.) Dis. Abst. 31A: 2767-2768; Dec. 1970.

While a positive relationship was found between hours in methods courses and "competence level" of teachers, pupil achievement was not found to be affected by teacher's knowledge of mathematics. (grades 3, 6, teachers; 1,034 pupils, 24 teachers)

Crespy, H. Victor. A Study of Curriculum Development in School Mathematics by National Groups, 1950-1966: Selected Programs. (Temple University, 1969.) Dis. Abst. 31A: 923-924; Sept. 1970.

Twenty-four projects were analyzed on factors such as impetus for origin, premises, content, materials developed, evaluation, and teacher training, with two (GCMP, USISM) studied in detail. (grades K-12; 24 programs)

Crowder, Richard Post. The Effect of a Modern Mathematics Program on Achievement in Arithmetic and on Intelligence Test Scores of Children in Grades Four Through Six in a Selected Air Force Dependent School. (University of Arkansas, 1969.) Dis. Abst. 30A: 2901; Jan. 1970.

Pupils in grades 4 and 6 in the modern program achieved above the normal rate of achievement in arithmetic computation and concepts, but not in applications, while fifth graders achieved higher in all categories. Gains were also found on IQ test scores. (grades 4-6; 5 classes)

Dahle, Mary McMahon. A Procedure for the Measurement of the Content Validity of Standardized Tests in Elementary Mathematics. (University of Southern California, 1970.) Dis. Abst. 30A: 5336; June 1970.

Using a grid of 120 objectives which ranged across five taxonomic levels, it was found that a textbook series corresponded closely to the distribution of objectives, while less correspondence was noted for standardized tests. (elementary)

Davis, Edward J. A Study of the Ability of Selected School Pupils to Perceive the Plane Sections of Selected Solid Figures. (The University of Florida, 1969.) Dis. Abst. 31A: 57; July 1970.

Sixth graders scored significantly below those in grades 8 and 10 in performance with four solids and each of four cuts performed on the solids. (grades 6, 8, 10; 90 pupils)

Delidow, Stanley Victor. A Study of Inquiry and Conceptual Ideas at Selected Grade Levels. (Wayne State University, 1969.) Dis. Abst. 30A: 3710; Mar. 1970.

Upper grade pupils selected categories mostly on the basis of quantitative characteristics; lower grade pupils selected by qualitative judgments. Ability to predict and to experiment were age-related. Understanding of probability was observed only in grade 11. (grades K, 2, 5, 8, 11; 293 pupils)

Dettmers, Ronald Dale. An Experimental Comparison of Three Methods of Teaching Mathematical Logic to Prospective Elementary Teachers. (The University of Michigan, 1969.) Dis. Abst. 31A: 661-662; Aug. 1970.

There were no significant differences on a logic test between the group taught logic with continuing reinforcement and one taught logic alone, but both scored significantly higher than a group not taught logic. On general mathematics achievement, no difference was found. (pre-service teachers)

Dickerscheid, Harold. Curricular Implications of Mathematical Concepts of the Preschool Child. (The Ohio State University, 1969.) Dis. Abst. 30A: 4326-4327; Apr. 1970.

Children who scored higher on the inventory exhibited more use of mathematics. While the order of learning concepts was similar, those in a Head Start group scored lower than those in Laboratory classes. (ages 3, 4; 68 children)

Diedrich, Richard Charles. The Effects of Studying Decimal and Non-Decimal Numeration Systems on Mathematical Understanding - Retention and Transfer. (Syracuse University, 1969.) Dis. Abst. 30A: 3183-3184; Feb. 1970.

Study of five bases appeared significantly more effective than a study of three bases in increasing understanding of the decimal system; however, study of the decimal system alone was at least as effective. (grade 4; 111 pupils)

Dilley, Clyde Alan. A Comparison of Two Methods of Teaching Long Division. (University of Illinois at Urbana-Champaign, 1970.) Dis. Abst. 31A: 2248; Nov. 1970.

Significant differences were found on an applications test favoring use of the successive subtractions algorithm, and on the retention test favoring the distributive algorithm. (grade 4; 10 classes)

Dull, Alyn Neil. The Construction and Standardization of a Test of Mathematical Understanding at the Sixth-Grade Level. (University of South Dakota, 1969.) Dis. Abst. 30A: 4271; Apr. 1970.

Reliability was found to be .76 for a test using abstract symbols in place of numerals in many items. (grade 6; 1,755 pupils)

Early, Joseph Everett. A Study of the Grade Level Teaching Preferences of Prospective Elementary Teachers with Respect to Their Attitudes Toward Arithmetic and Achievements in Mathematics. (The University of Tennessee, 1969.) Dis. Abst. 30A: 3345-3346; Feb. 1970.

About 13 per cent of the group changed their teaching level preferences during the course. Attitude toward arithmetic of those selecting grades 4-6 was significantly higher than those selecting grades K-3, due not to change in attitude but to change in preference. No relationship between achievement and teaching level preference was found. (pre-service teachers; 144 students)

Ehmer, Charles L. The Vocabulary of Contemporary Mathematics. (University of Pittsburgh, 1969.) Dis. Abst. 30B: 5132-5133; May 1970.

Those in grades 4 and 5 today appeared to have a better and earlier understanding of terms used in a 1930 study than the group tested in 1930 did, while sixth graders scored approximately the same. The earlier group had a better understanding of commercial terms, while today's group knew terms relating to the four operations better; however, they scored lower on computational achievement than on other areas. (grades 4-6; 400 pupils)

Eicher, Charles Edward. The Effects of Instruction in Interaction Analysis on the Verbal Teaching Behavior of Elementary Mathematics Methods Students. (Indiana University, 1969.) Dis. Abst. 31A: 262; July 1970.

Instruction in interaction analysis was effective in bringing about change in verbal teaching behavior in terms of specific types of questions asked (open-ended) and type of student response. (pre-service teachers; 68 students)

Erickson, Barney Lee. Effects of a College Mathematics Sequence Upon the Attitudes and Achievement in Mathematics of Prospective Elementary School Teachers. (Utah State University, 1970.) Dis. Abst. 30A: 5337; June 1970.

Students' achievement and attitude toward mathematics changed significantly during a two-quarter mathematics sequence. (pre-service teachers; 117 students)

Fennema, Elizabeth Hammer. A Study of the Relative Effectiveness of a Meaningful Concrete and a Meaningful Symbolic Model in Learning a Selected Mathematical Principle. (The University of Wisconsin, 1969.) Dis. Abst. 30A: 5338-5339; June 1970.

There were no significant differences in overall learning of a principle when learning was facilitated by a meaningful concrete or a meaningful symbolic model, but the symbolic model resulted in significantly better transfer. (grade 2)

Ferguson, Loree Humphrey. The Applicability of Specific Phonic Generalizations to Elementary Mathematics Textbooks. (University of Oklahoma, 1970.) Dis. Abst. 31A: 2250; Nov. 1970.

High correlations for the applicability of phonic generalizations to mathematics and other programs were found. (grades 1-6; textbooks)

Ferguson, Richard Leroy. The Development, Implementation, and Evaluation of a Computer-Assisted Branched Test for a Program of Individually Prescribed Instruction. (University of Pittsburgh, 1969.) Dis. Abst. 30A: 3856; Mar. 1970.

The described branched test could provide the same information for the mathematics unit studied as a conventional paper-and-pencil test in one-half the time and with substantially greater reliability in aiding instructional decision-making. (elementary; 75 pupils)

Ferney, Gary Axel. An Evaluation of a Program for Learning in Accordance with Needs. (Washington State University, 1969.) Dis. Abst. 30A: 4327; Apr. 1970.

The group not using PLAN achieved significantly higher on arithmetic reasoning than the group using PLAN. Girls using PLAN achieved higher scores than did boys, and thus PLAN may be more related to the learning styles of girls. (grade 5; 371 pupils)

Fortson, Laura Rogers. A Creative-Aesthetic Approach to Readiness and Beginning Reading and Mathematics in the Kindergarten. (University of Georgia, 1969.) Dis. Abst. 30A: 5339; June 1970.

Those experiencing the approach involving multiple-stimuli discovery activities made significantly higher gains on readiness and creativity tests than those using a traditional approach. (grade K [age 5]; 142 pupils)

Frayer, Dorothy Ann. Effects of Number of Instances and Emphasis of Relevant Attribute Values on Mastery of Geometric Concepts by Fourth- and Sixth-Grade Children. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 643; Aug. 1970.

Increasing the number of instances from four to eight did not significantly affect overall concept mastery at either grade level, though it improved recognition of non-examples by fourth graders. Emphasis of relevant attribute values significantly increased recognition and production of attribute names and overall mastery by fourth graders, and recognition of names by sixth graders. (grades 4, 6)

Gardner, Harvey F. A Comparison of the Modern and Traditional Mathematics Curriculums and Their Effects on Standardized Test Scores. (Southern Illinois University, 1969.) Dis. Abst. 30A: 2847-2848; Jan. 1970.

No significant differences between curriculums was found at grades 3 and 4. In grade 2, skills were achieved better by those in the traditional curriculum and concepts by those in the modern curriculum. No significant difference was found for adequacy of teacher training. (grades 2-4; 439 pupils)

George, Linda Olsen. Selected Factors Which Affect Young Children's Concepts of Conservation of Length. (Indiana University, 1970.) Dis. Abst. 31A: 2735; Dec. 1970.

Significant differences in conservation behavior occurred as age increased; the threshold appeared to be between ages 4 and 5. The type of direction used by the experimenter and the use of rods of different lengths affected conservation behavior. (ages 3-7; 100 pupils)

Girgus, Joan S. A Developmental Study of the Recognition of Sequentially Presented Forms. (New School for Social Research, 1969.) Dis. Abst. 31B: 413; July 1970.

Between ages 4.7 and 8.5, ability to recognize three sequentially presented geometric forms increased; all age groups recognized the forms when wholly presented. Increasing the amount of contour visible per view and the number of presentations resulted in improved recognitions for all ages. (ages 4-10)

Gosciewski, Francis William. The Effect of Expectancy Reinforcement on Arithmetic Achievement, Self-Concept, and Peer-Group Status of Elementary School Children. (Kent State University, 1970.) Dis. Abst. 31A: 2179-2180; Nov. 1970.

Use by both teachers and parents of reinforcement statements "in excess of what was in fact achieved" did not significantly affect achievement nor improve self-concept. (grade 4; 96 pupils)

Gray, William Lee. The Effects of an Integrated Learning Sequence on the Acquisition and Retention of Mathematics and Science Behaviors in Grade Five. (University of Maryland, 1970.) Dis. Abst. 31A: 2004; Nov. 1970.

A higher achievement level was attained when unspecified mathematical content was integrated with unspecified science content than when each was presented independently. (grade 5; 900 pupils)

Greabell, Leon Charles, Jr. A Comparison of Mathematical Competency Between Prospective Elementary School Teachers Utilizing a Student Goal Determined Approach to Study Mathematics and Prospective and Elementary School Teachers Enrolled in an Instructor Goal Determined Course in Mathematics. (Syracuse University, 1969.) Dis. Abst. 31A: 1661-1662; Oct. 1970.

Scores in all groups were higher than those reported in other studies, but no meaningful differences were found between groups. (pre- and in-service teachers)

Green, Geraldine Ann. A Comparison of Two Approaches, Area and Finding a Part of, and Two Instructional Materials, Diagrams and Manipulative Aids, on Multiplication of Fractional Numbers in Grade Five. (The University of Michigan, 1969.) Dis. Abst. 31A: 676-677; Aug. 1970.

The "area" approach was more effective than the "finding a part of" approach; diagrams and materials appeared equally effective. The Area-Diagram combination was most successful, with the Of-Materials approach second, and Of-Diagram ranking worst. Attitude differences and learning difficulties are noted. (grade 5; 480 pupils)

Green, Robert Wesley. A Survey of the Mathematical Instructional Materials Used in Teaching Culturally Disadvantaged Children Grades 1 Through 6 Throughout the United States. (Indiana University, 1969.) Dis. Abst. 31A: 1101; Sept. 1970.

Of 59 materials listed, an average of 38 per cent were furnished to teachers, with lower grades receiving more than upper grades. Sixth grade teachers used materials more for demonstration, while they were used more for manipulation in other grades. (grades 1-6; 232 teachers)

Greenberg, Judith Widoff. Visual Perceptual Abilities of Young Children in Synthesis and Analysis Tasks. (Columbia University, 1969.) Dis. Abst. 30A: 4273-4274; Apr. 1970.

Positive correlations were found between visual synthesis and analysis of geometric forms, and the relationship of each to the more complex tasks of construction and block design was positive. (ages 5-7; 80 pupils)

Greenes, Carole Ellen Zeiger. Preferences for Certain Attributes in Plane Geometric Figures. (Boston University School of Education, 1970.) Dis. Abst. 31B: 2820-2821; Nov. 1970.

Shape rather than area or orientation was found to be the attribute most important to a recognition of the relationship between two figures. (ages 5-9; 320 pupils)

Greenough, Franklin Hawes. Selective Utilization of Mathematics Textbooks by Elementary School Teachers. (University of Idaho, 1969.) Dis. Abst. 31A: 289-290; July 1970.

Teachers stated preference for and against one of three texts. All teachers departed from their texts, with less frequency, however, if they had a neutral opinion of it. (teachers in grades 3, 5; 60 teachers)

Grunwald, George B. The Relative Effectiveness of Different Types of Help-Sessions When Teaching Mathematics to a Large Section of Prospective Elementary Teachers. (George Peabody College for Teachers, 1969.) Dis. Abst. 30A: 4874; May 1970.

Large group and small group instruction were equally effective, even for students in the large group given varying forms of help-sessions. Attitudes were not changed, though teaching of arithmetic was viewed with less trepidation after the course. (pre-service teachers; 247 students)

Harmon, Adelaide T. Problem Solving in Contemporary Mathematics: The Relative Merits of Two Methods of Teaching Problem Solving in the Elementary School. (New York University, 1969.) Dis. Abst. 30B: 3748; Feb. 1970.

An expository and an inquiry method were equally effective for general problem solving instruction, at all IQ levels. The expository method was more effective for rate, comparison, and percent-ratio type problems, especially for average and high IQ groups, while the inquiry method seemed better for low groups. (grade 6; 10 classes)

Hatch, Ronald LaVern. A Comparison of Slow Learners of Low and Middle Socioeconomic Status on Academic Achievement, Self Concepts, and Intelligence Test Scores. (Syracuse University, 1970.) Dis. Abst. 31A: 2761; Dec. 1970.

No significant differences were found between slow learners of low and middle SES on arithmetic achievement tests. (grade 6; 65 pupils)

Hater, Sister Mary Ann. The Cloze Procedure as a Measure of the Reading Comprehensibility and Difficulty of Mathematical English. (Purdue University, 1969.) Dis. Abst. 30A: 4829; May 1970.

Cloze tests were found to be highly reliable measures and valid predictors of reading difficulty, with a correlation of .69 with comprehension test scores. (grades 7-10; 1,717 pupils)

Hausher, Howard Leonard. A Comparison of Mathematics Programs Followed by Students Tested in England and in the United States. (University of Virginia, 1969.) Dis. Abst. 31A: 65-66; July 1970.

Content emphases in an English textbook series corresponded more to emphases on an achievement test than did two American series. (elementary; 3 textbook series)

Hendrickson, Arthur Dean. A Study of the Relative Effectiveness of Three Methods of Teaching Mathematics to Prospective Elementary School Teachers. (University of Minnesota, 1969.) Dis. Abst. 31A: 1117; Sept. 1970.

No significant differences in achievement were found between groups using a mathematics laboratory, an enrichment problem, or a conventional approach, though all gained. Attitude also improved, though only one significant difference was found, favoring the conventional group. (pre-service teachers; 90 students)

Higgins, James Edward. The Effects of Non-Decimal Numeration Instruction on Mathematical Understanding. (Indiana University, 1970.) Dis. Abst. 31A: 2791-2792; Dec. 1970.

No significant differences in mathematical understanding (of base ten) at either of two SES levels were found between groups given numeration instruction in base five or base ten, or given no specific numeration instruction. (grade 5; 14 classes)

Hilton, Alice Schafer. The Understandings of Mathematics and the Attitudes Toward Mathematics Expressed by Prospective Elementary School Teachers. (State University of New York at Buffalo, 1969.) Dis. Abst. 31A: 266; July 1970.

Significant increase in achievement was made during the professional sequence, with 69.4 per cent evidencing an increase in mathematical knowledge. Significant positive change in attitudes also occurred, expressed by 75 per cent. Correlations between attitude and achievement were positive. (pre-service teachers; 72 students)

Hoover, Gail Louise. Learning to Learn Mathematics Independently: A Study at the Fourth Grade Level. (Syracuse University, 1969.) Dis. Abst. 31A: 293; July 1970.

No meaningful differences were found on most measures for pupils using a write-in text and those having conventional instruction. (grade 4; 173 pupils)

Howard, Vivian Gordon. Teaching Mathematics to the Culturally Deprived and Academically Retarded Rural Child. (University of Virginia, 1969.) Dis. Abst. 31A: 294-295; July 1970.

Mathematics laboratory experiences, planned to facilitate learning a hierarchy of needed concepts, were successful, resulting in both achievement and attitudinal gains. (elementary; 12 pupils)

Hutton, Jerry Bob. Relationships Between Preschool Screening Test Data and First Grade Academic Performance for Head Start Children. (University of Houston, 1970.) Dis. Abst. 31B: 395; July 1970.

A group readiness test (STAR) and a teacher rating given at the end of a Head Start program were found to be usable predictors of first grade achievement. (grade 1; 108 pupils)

Johnson, Roger Thornten, Jr. A Comparison of Categorizing Ability in High and Low Socioeconomic Kindergarteners. (University of California, Berkeley, 1969.) Dis. Abst. 31A: 225; July 1970.

High SES children demonstrated more ability to consistently categorize on attribute resemblance than low SES children did. A similar cognitive development in categorizing was indicated, with the possibility of a slower pace for those with low SES. (grade K; 40, 60 pupils)

King, Irvin Leon. A Formative Development of a Unit on Proof for Use in the Elementary School. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 680-681; Aug. 1970.

Prerequisite skills and all proofs in the unit were mastered; achievement was significantly higher than that of a control group. Use of two other groups in developing the unit was a successful procedure. Teaching proof may be beyond the capabilities of the typical elementary school teacher, however. (grade 6; 20 pupils)

Krebs, Eleonore Goodlin. The Wechsler Preschool and Primary Scale of Intelligence and Prediction of Reading Achievement in First Grade. (Rutgers - The State University, 1969.) Dis. Abst. 30A: 4279; Apr. 1970.

The most effective predictors of reading achievement were specified mathematical subtests. (grade 1; 70 pupils)

Kriewall, Thomas Edward. Applications of Information Theory and Acceptance Sampling Principles to the Management of Mathematics Instruction. (The University of Wisconsin, 1969.) Dis. Abst. 30A: 5344; June 1970.

The systems approach, test theory, and the development of computer-managed instruction are analyzed as needed components of programs featuring self-selection and self-pacing.

Leake, Charles R. Interest Changes in Mathematics of Selected College Students in New York State. (New York University, 1969.) Dis. Abst. 30A: 2853; Jan. 1970.

Significant relationships were found between change in interest and class, course, text, instructor, and college. Elementary education majors showed a gain in interest, not found in other major areas of study. (pre-service teachers; 929 students)

Linville, William Jerome. The Effects of Syntax and Vocabulary Upon the Difficulty of Verbal Arithmetic Problems with Fourth Grade Students. (Indiana University, 1969.) Dis. Abst. 30A: 4310; Apr. 1970.

Syntactic structure and vocabulary levels were both found to be determiners of difficulty in problems, with vocabulary level perhaps the more crucial. Those with high ability and high reading achievement met greater success in problem solving. (grade 4; 408 pupils [12 schools])

Logiudice, Joseph F. The Relationship of Self-Esteem, Test Anxiety and Sixth Grade Students' Arithmetical Problem Solving Efficiency Under Variant Test Instructions. (St. John's University, 1970.) Dis. Abst. 31B: 2995-2996; Nov. 1970.

Satisfactory self-esteem was found to be related to success in mathematics. (grade 6)

Maricle, William O. A Follow-Up Study of an Experimental Seventh-Grade Mathematics Program. (University of Colorado, 1969.) Dis. Abst. 31B: 1403-1404; Sept. 1970.

The experimental program involving in-depth study of mathematical relationships and understandings as they pertain to the algorithms of the fundamental operations was generally successful, especially for high ability students. During the senior high school, the experimental group pursued more mathematics courses and achieved as well as the conventionally-taught group. (grade 7)

Masalski, William Joseph. The Design and Feasibility Study of the Mathematics Component of the Model Elementary Teacher Education Program. (University of Massachusetts, 1970.) Dis. Abst. 31A: 2233; Nov. 1970.

No significant differences in achievement were found between free-choice or no-choice conditions for four instructional procedures: class participation, semi-automatic audio-visual, written program, and standard textbook. Attitude was highest for those using the audio-visual mode. (pre-service teachers; 96 students)

Masek, Richard Martin. The Effects of Teacher Applied Social Reinforcement on Arithmetic Performance and Task-Orientation. (Utah State University, 1970.) Dis. Abst. 30A: 5345-5346; June 1970.

Significant increases in arithmetic performance and task-orientation of underachieving students were reported during periods when teachers emphasized reinforcement such as verbal praise, physical contact, and facial expression. Reduced performance rates were noted when reinforcement was withdrawn, with increased rates when reinforcement was reinstated. (grades 1, 2; 12 pupils)

Matthews, Cecil Allen. The Effect of an All Male Kindergarten and First Grade Environment on the Development of Boys. (Colorado State College, 1969.) Dis. Abst. 30A: 4148; Apr. 1970.

The group with both boys and girls taught by a female teacher had higher achievement in arithmetic than an all-boy group taught by a male teacher; however the first group also had more number readiness work. (grades K-2; 42 pupils)

Matulis, Robert Stanley. A Survey of the Understandings of Selected Concepts of Logic by 8-18-Year-Old Students. (The University of Florida, 1969.) Dis. Abst. 31A: 1079; Sept. 1970.

Age, intelligence, and SES were significant factors in students' understanding of deductive logic, but sex was not significant. Variability of scores increased as age increased. (ages 8-18 [grades 4-12]; 860 pupils)

McGettigan, James Francis. Conservation of Number in Young Mentally Retarded Children. (Columbia University, 1969.) Dis. Abst. 31A: 2739-2740; Dec. 1970.

The retarded children conserved number, with neither the number of objects (3-8) nor whether pupil or teacher manipulated objects affecting scores. (ages 8-10 [IQ 50-80]; 120 pupils)

McKee, Marjorie Ann Brand. The Components of Academic Success Studied in Seventy-Five (75) Educable Retarded Children: A Descriptive Study of Selected Factors. (Wayne State University, 1969.) Dis. Abst. 30A: 3859; Mar. 1970.

Arithmetic achievement was not affected by social level of the community, but those from less affluent homes made more growth yearly than those from more affluent homes. Greater gains in arithmetic were evidenced at older MA levels. (elementary [EMR's]; 30 classes)

McLaughlin, John Paul. Mathematics Achievement in Relation to Textbook Communication Style and Ability Group Membership: A Comparison of Two Seventh Grade Mathematics Textbooks. (The University of Texas at Austin, 1969.) Dis. Abst. 30A: 2911; Jan. 1970.

For middle and upper ability students, use of a textbook which includes more discussions, symbolic notation, and explanatory material enhanced achievement on modern topics. (grade 7; 2 classes)

McNerney, Charles Robert. Effects of Relevancy of Content on Attitudes Toward, and Achievement in, Mathematics by Prospective Elementary School Teachers. (The Ohio State University, 1969.) Dis. Abst. 30A: 2885; Jan. 1970.

The course in which slides of children's texts were used to relate content to the classroom produced a greater positive effect on attitude and achievement than did a course taught by lectures only. (pre-service teachers; 430 students)

Meyer, Rochelle Wilson. The Identification and Encouragement of Mathematical Creativity in First Grade Students. (The University of Wisconsin, 1969.) Dis. Abst. 31B: 809-810; Aug. 1970.

Six criteria describing mathematics creativity were developed for use in observations. Use of open-ended problems did not result in an increase in pupils' observable mathematical creativity nor general creativity. (grade 1; 2 classes)

Miller, Daniel David. The Effect of Automated Marking on Sixth Graders Mathematics Achievement. (Arizona State University, 1970.) Dis. Abst. 31A: 2740; Dec. 1970.

Use of a marking machine (providing immediate feedback) resulted in significantly higher achievement scores. (grade 6; 215 pupils)

Miller, Donald Donavon. The Affective Influence of a Marking Machine on an Elementary Classroom. (Arizona State University, 1970.) Dis. Abst. 31A: 2740-2741; Dec. 1970.

Use of a marking machine (providing immediate feedback) resulted in a significant increase in positive attitude toward machines and knowledge of results, but no differences in attitude toward mathematics and teacher role were found in comparison with a group not using the machine. (grade 6; 215 pupils)

Miller, Wayne Edgar. A Study of Amish Academic Achievement. (The University of Michigan, 1969.) Dis. Abst. 30A: 4197; Apr. 1970.

Amish pupils scored significantly higher than non-Amish pupils on arithmetic problem solving. Integration did not appear to have a positive effect. (grade 8)

Minsky, Raphael. An Investigation Into Children's Conceptualization of Proportionality as Expressed in Their Drawings of the Male Human Figure. (University of Maryland, 1969.) Dis. Abst. 31A: 1082; Sept. 1970.

The finding that five-year-olds have developed the skill to discriminate between bodily dimensions and express them through drawings may indicate that more complex activities involving geometric form relating to proportionality in arithmetic concepts could be introduced earlier. (ages 5, 7, 9, 11, 13; 400 pupils)

Mix, Harry Herman. An Examination of a Program Designed to Advance the Academic Progress of Underachieving Elementary School Pupils. (Columbia University, 1969.) Dis. Abst. 30A: 3642-3643; Mar. 1970.

While the arithmetic performance of normal to bright underachievers improved when special (unspecified but varied) educational approaches were provided, it was not possible to identify any specific factors which promoted the change. (grades 4-6; 60 pupils)

Moore, Carolyn Chick. Selected Approaches and Activities to Enhance the Teaching of Certain Identified Areas of Difficulty in Primary School Mathematics. (The University of Mississippi, 1969.) Dis. Abst. 31A: 565; Aug. 1970.

Seventeen concepts from the third grade curriculum were identified by teachers as being significantly difficult for third graders. A curriculum supplement, with a sequence of tasks and suggested activities and teaching approaches, was prepared. (teachers of grade 3; 129 teachers)

Morford, Myron Lee. A Taxonomic Approach to the Prediction of Achievement in Mathematics Education for Prospective Elementary Teachers. (Kent State University, 1969.) Dis. Abst. 30A: 4314-4315; Apr. 1970.

Grade-point averages were the most powerful predictors of achievement on the developed taxonomy-type instrument. Not all cognitive descriptors correlated significantly with the instrument. (pre-service teachers; 126 students)

Morrell, James E. A Comparison of Four Methods of Instructional Teacher Feedback from Practice Worksheets in Fifth Grade Arithmetic. (Lehigh University, 1970.) Dis. Abst. 31A: 2794; Dec. 1970.

Pupils who corrected errors or who were retaught frequently missed problems, either with or without written comments, retained more than pupils who only had written comments on their practice work. High-achieving boys scored higher on the practice work than high-achieving girls, but girls were better at medium and low achievement levels. (grade 5; 75 pupils)

Moxley, Roy Anthony, Jr. A Program for Reducing Reversals of Digits and Symbols Produced by Kindergarten Children. (University of Michigan, 1970.) Dis. Abst. 31A: 2192-2193; Nov. 1970.

Percentage of reversals was reduced after pupils used programmed materials on which they matched digits and reproduced increasingly less complete models. (grade K; 20 pupils)

Murray, John P. Social Learning and Cognitive Development: Modeling Effects on Children's Understanding of Conservation. (The Catholic University of America, 1970.) Dis. Abst. 31B: 3030; Nov. 1970.

Observation of a model appropriate or not appropriate to the child's level of conservation produced no generalized or stable changes in that level. (ages 5-10; 120 pupils)

Nagel, Thomas Scott. A Descriptive Study of Cognitive and Affective Variables Associated with Achievement in a Computer-Assisted Instruction Learning Situation. (Michigan State University, 1969.) Dis. Abst. 30A: 5295; June 1970.

Variables which best related to achievement on tests from a CAI drill-and-practice program were identified. For sex, only in grade 6 was there a significant difference favoring boys; almost no correlation was found between SES and achievement. Affective variables appeared to have some importance. (grades 2-6)

Needleman, Joan Rines. Scalogram Analysis of Certain Area Concepts Proposed by Piaget. (Boston University School of Education, 1970.) Dis. Abst. 31B: 3030-3031; Nov. 1970.

A developmental scale of space and measurement concepts prerequisite to understanding rectangular area and its computation was found to exist, with a significant relationship between acquisition of the concept of area and that of operational continuity. (grades 3-8 [ages 8-14]; 69 pupils)

Nelson, Robert John. An Investigation of a Group Test Based on Piaget's Concepts of Number and Length Conservation and Its Ability to Predict First-Grade Arithmetic Achievement. (Purdue University, 1969.) Dis. Abst. 30A: 3644; Mar. 1970.

Correlations between items on group and individual tests of conservation ranged from .54 to .88. Pupils who took the group test first performed significantly better on the individual test than those who had no exposure to conservation tasks prior to taking the individual tests. The individual test did not significantly influence group test performance, nor did either influence performance on an arithmetic achievement test. (grade 1; 163 pupils)

Nowell, Willis Cullen. The Effectiveness of the Learning Resource Teacher as a Treatment Component of Elementary and Secondary Education Act, Title I, Programs for Culturally Disadvantaged Children. (The University of Tennessee, 1969.) Dis. Abst. 30A: 3198-3199; Feb. 1970.

For groups in which a learning resource teacher was used, significant differences in computation and problem solving scores were attained, attributable to gains made by Negro students. (elementary; 339 pupils)

Palow, William Paul. A Study of the Ability of Public School Students to Visualize Particular Perspectives of Selected Solid Figures. (The University of Florida, 1969.) Dis. Abst. 31A: 78-79; July 1970.

Children appeared to acquire the ability to visualize sections of solid figures (Euclidean space) at about age 12, supporting Piaget's position. (grades 3-12; 120 pupils)

Passi, Sneh Lata. An Examination of the Cognitive Processes Fostered by the Content of Selected Elementary School Mathematics Series. (State University of New York at Buffalo, 1970.) Dis. Abst. 31A: 1516; Oct. 1970.

The frequency of Translating, Analyzing, Synthesizing and Evaluating levels was found to be low. The Manipulating level dominated the textbook activities. (grades 3-6; 3 textbook series)

Peglar, Marian. A Comparison of Operational Seriation of Lengths and Weights in Piagetian Tasks. (Iowa State University, 1969.) Dis. Abst. 30B: 5227; May 1970.

Children in the three lowest grades failed to exhibit logically operational behavior in ordering stimuli differing by length or by weight. Sixth graders were more successful, but did not meet the criterion of successful group performance (75 per cent). (grades 2, 3, 4, 6; 64 pupils)

Peterson, John Charles. Effect of Exploratory Homework Exercises Upon Achievement in Eighth Grade Mathematics. (The Ohio State University, 1969.) Dis. Abst. 30A: 4339; Apr. 1970.

A group receiving exploratory homework assigned for three days prior to teaching of a topic and a group receiving mathematical puzzles unrelated to the mathematics taught each achieved better than a group receiving no homework. Those who completed at least 50 per cent of the assignments in the first group achieved more than the comparable portion of the puzzle group. (grade 8; 6 classes)

Phillips, Robert Bass, Jr. Teacher Attitude as Related to Student Attitude and Achievement in Elementary School Mathematics. (University of Virginia, 1969.) Dis. Abst. 30A: 4316-4317; Apr. 1970.

Most-recent-teacher attitude was significantly related to student attitude. Type of teacher attitude encountered by the student for two and for three of his past three years was significantly related to his present attitude and to his achievement. (grade 7, teachers; 306 pupils, 59 teachers)

Piatt, Robert George. An Investigation of the Effect the Training of Teachers in Defining, Writing and Implementing Educational Behavioral Objectives Has on Learner Outcomes for Students Enrolled in a Se enth Grade Mathematics Program in the Public Schools. (Lehigh University, 1969.) Dis. Abst. 30A: 3352; Feb. 1970.

Students whose teachers were trained to write behavioral objectives achieved significantly higher scores on subtests of computation and concepts than those whose teachers had no such training. No differences were found on the applications subtest. A more positive attitude toward the effectiveness of the untrained teachers was found, however. (grade 7; 600 pupils)

Pickering, Charles Thomas. A Study of Intellectual Abilities of Culturally Disadvantaged Children as Predictors of Achievement in Reading, Mathematics, and Listening in Grade One. (Ohio University, 1969.) Dis. Abst. 31A: 1085; Sept. 1970.

A correlation of .78 was found between scores on tests on spatial relations, understanding mathematics, communication skills, and logical reasoning, and achievement scores. (grade 1; 170 pupils)

Pittman, Robert Fred. An Examination of Objectives for Learning Centers. (Northern Illinois University, 1970.) Dis. Abst. 31A: 2795; Dec. 1970.

No overall significant relationships between family adjustment and arithmetic achievement were found, though in grade 5 high-adjusted girls achieved significantly better than medium-adjusted girls. (grades 4-6; 51 classes)

Prichard, Paul Newton. The Effects of Desegregation on Selected Variables in the Chapel Hill City School System. (University of North Carolina at Chapel Hill, 1969.) Dis. Abst. 30A: 3697; Mar. 1970.

White students achieved significantly higher than Negro students, but there were no significant negative effects of desegregation for either group. Significant positive changes in mathematics achievement were found in grades 5 and 7 for Negroes and in grade 5 for whites. Sex had little effect on mathematics achievement. (grades 5, 7, 9)

Qualls, Lula Jane. Effects of Review and Cueing on Elementary School Teachers' Performance on a Standardized Mathematics Test. (The University of Tennessee, 1969.) Dis. Abst. 30A: 4693; May 1970.

The treatment in which teachers were given cues appeared more effective than merely taking a second form of the test, but not more effective than review and giving correct answers. No differences among treatments were apparent for students. (teachers, grades 1-6; 54 teachers, 54 pupils)

Reid, Isaiah. Diffusion of Innovations in Elementary Schools: A Study of the Primary Sources of Information Used by Teachers. (Cornell University, 1969.) Dis. Abst. 30A: 3697-3698; Mar. 1970.

Teachers cited three sources of information about modern mathematics and two other innovations at all stages of the adoption continuum: professional publications, professional preparation, and colleagues. A fourth source varied with each stage. (teachers; 160 teachers)

Reitz, Ronald Tennyson. A Comparison of Methods for Teaching Conservation of Number to Retardates. (The Pennsylvania State University, 1970.) Dis. Abst. 31A: 2796; Dec. 1970.

Of four combinations tested, the most effective technique consisted of training on conservation of number problems with yes/no feedback plus verbal mediation. (ages 6-13 [IQ 55-84]; 40 pupils)

Robinson, Lucile Thurston. An Exploratory Study of the Utilization of Spatial Concepts by Children. (Claremont Graduate School and University Center, 1970.) Dis. Abst. 31A: 1631; Oct. 1970.

While a progression in the use of spatial concepts was found, there was no relationship between a child's competence in directing his movement by polar coordinates and his competence in using rectangular coordination. (grades 1-6; 120 pupils)

Robinson, Violet Helen Ban. An Investigation of the Performance of Kindergarten Children on Quantitative Class Inclusion Tasks. (Stanford University, 1970.) Dis. Abst. 31A: 1631-1632; Oct. 1970.

Visually observable attributes, meaningful concepts, and diagram-like arrangements did not facilitate achievement on class inclusion tasks; a functional basis of classification helped. (grade K [ages 5, 6]; 120 pupils)

Rudolph, William Brown. Estimates of the Relative Sequential Constraint for Selected Passages from Mathematics Books and the Relationship of These Measures to Reading Comprehension. (Purdue University, 1969.) Dis. Abst. 30A: 4880; May 1970.

Sequential constraint was found to be no greater for modern mathematics books than for traditional books. Constraint varied between topics and was inversely related to reading comprehension and grade level. The deductive style was more constrained than the inductive style. (elementary; 18 books)

Schall, William Edward. A Comparison of Mental Arithmetic Modes of Presentation in Elementary School Mathematics. (The Pennsylvania State University, 1969.) Dis. Abst. 31A: 684; Aug. 1970.

Experiences with mental arithmetic resulted in increased ability to compute mentally and a gain in attitude. No significant differences were found between groups who used televised lessons, audio-tape, or programmed materials. (grade 5; 399 pupils)

Schmelter, Raymond Charles. A Study of Attitude Change of Elementary Teachers in an In-Service Mathematics Education Program. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 667-668; Aug. 1970.

Significant gains in attitude toward mathematics and toward specified instructional techniques, including television, were found. Attitude toward radio instruction decreased. (teachers; 213 teachers)

Schwager, Melvin Sol. The Experimental Acquisition of the Concept of Conservation of Number in Young Children. (University of Illinois, 1969.) Dis. Abst. 31A: 648; Aug. 1970.

Nonconservers who had developed mathematical and quantity readiness were taught to conserve through experiences in reversibility, cognitive conflict, differentiation, or inference. Only one-fourth of these trained pupils did not continue to evidence conservation after an "extinction" procedure. (ages 5, 6; 82 pupils)

Scott, Allen Wayne. An Evaluation of Prescriptive Teaching of Seventh-Grade Arithmetic. (North Texas State University, 1969.) Dis. Abst. 30A: 4696; May 1970.

Students using programmed materials appropriate to meet diagnosed needs made a significantly greater gain in computation scores than did students in the regular classroom. Differences on concepts and applications were not significant. (grade 7; 50 pupils)

Shepler, Jack Lee. A Study of Parts of the Development of a Unit in Probability and Statistics for the Elementary School. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 1151-1152; Sept. 1970.

Instruction for average and above average students on 11 of 14 topics was successful, with mean score on all topics increasing from 37.9 per cent to 92.8 per cent. (grade 6; 1 class)

Sherman, Helene Zeeman. Common Elements of New Mathematics Programs for the Elementary School: Origin and Development. (Columbia University, 1969.) Dis. Abst. 31A: 84; July 1970.

Analysis of six new programs revealed that ten mathematical ideas formerly studied at more advanced levels were now included in the elementary school curriculum. How and why six of these ideas developed was traced, to provide background for teachers which may increase their understanding. (elementary; 6 programs)

Singh, Jane Marie. An Investigation of the Effect of Individualized Enrichment Homework Upon the Academic Achievement of Children in the Fourth, Fifth, and Sixth Grades. (Arizona State University, 1969.) Dis. Abst. 30A: 3203-3204; Feb. 1970.

Use of individualized enrichment homework resulted in significant achievement on most arithmetic subtests. (grades 4-6; 2 schools)

Sloan, Jack L. A Multivariate Study of Individual Differences Among Teachers and Pupils for a Specific Instructional Unit. (State University of New York at Albany, 1970.) Dis. Abst. 31A: 2748; Dec. 1970.

The sequencing used in teaching a unit on decimals was not significantly correlated with pupil achievement, but the pattern of emphasis was generally significantly correlated. (grade 6; 43 teachers, classes)

Sowder, Larry Kenneth. Discovery Learning: A Status Study, Grades 4-7, and an Examination of the Influence of Verbalizing Mode on Retention. (The University of Wisconsin, 1969.) Dis. Abst. 31A: 86-87; July 1970.

Most pupils could form generalizations in the selected numerical situations, although pupils of lower IQ required more instances. The optimal grade level at which to offer generalizing tasks appears to be grade 6 or after. (grades 4-7; 72 pupils)

Stanford, Thomas Enos. Effects of and Teacher Evaluation of Supplementary Activities on Seventh Grade Boys' and Girls' Achievement in and Preference for Mathematics. (The University of Mississippi, 1970.) Dis. Abst. 31A: 2798-2799; Dec. 1970.

Groups using games, or non-verbal problems, or self-selection of activities had significant increases in achievement. A local control group also showed a significant increase in achievement, while a remote control group did not. (grade 7; 420 pupils)

Swafford, Jane Oliver. A Study of the Relationship Between Personality and Achievement in Mathematics. (University of Georgia, 1969.) Dis. Abst. 30A: 5353; June 1970.

Students were classified into four groups on the basis of achievement in skills and understandings. Six personality factors were identified as discriminant in separating consistent achievement groups, and differences on various factors were noted. (grade 8; 335 pupils)

Swart, William Lee. A Comparative Study of the Effects of High- and Low-Structure Approaches to Developing Problem-Solving Ability in Fourth Grade Children. (The University of Michigan, 1969.) Dis. Abst. 31A: 669; Aug. 1970.

For usual textbook verbal problems, those who were directed to draw a picture "telling the entire story" did as well as those who were taught to write equations to solve the problems. For problems in area, the first group did significantly better than the second. (grade 4; 3 classes)

Swyers, William Randoll. An Exploratory Study of Auto-Instruction in Early Learning Experiences Utilizing Micro-Unit-Learning Models. (University of Georgia, 1969.) Dis. Abst. 30A: 5353-5354; June 1970.

Gains were reported at all three ability levels on materials designed within the parameters of taxonomies and learning hierarchies. Those in lower and younger groups made greater gains than those in higher and older groups, for whom the test had a restrictive "ceiling". (grade 1; 57 pupils)

Taback, Stanley Frederick. The Child's Concept of Limit. (Columbia University, 1969.) Dis. Abst. 30A: 4162; Apr. 1970.

Eight-year-olds could do little more than follow a simple rule of correspondence, while 10- and 12-year-olds were increasingly more successful on concepts of correspondence, neighborhood of a point, convergence, and limit point. Only at age 12 could most conceptualize an infinite process. (ages 8, 10, 12; 75 pupils [5 schools])

Terry, Arthur Franklin, Jr. An Investigation of the Relationship Between the Mathematics Achievement of Sixth Grade Students Under the Direction of the Teacher in the Self-Contained Classroom and the Teacher Specialist. (The University of Rochester, 1969.) Dis. Abst. 30A: 3355-3356; Feb. 1970.

No significant differences in achievement were found between groups taught by specialists or in a self-contained classroom. Most teachers and pupils liked mathematics. (grade 6; 560 pupils, 20 teachers)

Thomas, Halsey Laverne. An Analysis of Stages in the Attainment of a Concept of Function. (Columbia University, 1969.) Dis. Abst. 30A: 4163-4164; Apr. 1970.

Capable students at ages 11-14 could reach a relatively high level of attainment of the function concept and many could achieve understanding at an initial formal operational level. (grades 7, 8 [ages 11-14]; 201 pupils)

Thurner, Ronald David. Children's Perceptions of Linear Dot Patterns. (University of Minnesota, 1969.) Dis. Abst. 31A: 1091; Sept. 1970.

A significant number of children based responses on the length of density of the pattern, though they were nonconservers; possible reasons are discussed. (ages 4, 5; 20 pupils)

Uprichard, Albert Edward. An Experimental Study Designed to Determine the Most Efficient Learning Sequence of Three Set Relations in the Preschool Years. (Syracuse University, 1969.) Dis. Abst. 30A: 5304-5305; June 1970.

The most efficient learning sequence for the three relations was found to be "equivalence", "greater than", "less than". (age 4)

Walker, Charles Everett. The Effect of Variations in Test Administration Conditions on Arithmetic Test Performance. (The University of Rochester, 1969.) Dis. Abst. 31A: 242-243; July 1970.

No difference in scores on a computation test due to variations in the use of separate answer sheets, scrap paper, and test booklets was found. Study attitudes were found to be related to answer mode, but scholastic ability and study habits were not differentiating factors. (grade 7; 388 pupils)

Wardrop, Robert Frear. The Effect of Geometric Enrichment Exercises on the Attitudes Toward Mathematics of Prospective Elementary Teachers. (Indiana University, 1970.) Dis. Abst. 31A: 670; Aug. 1970.

Neither attitude nor achievement were significantly affected by the inclusion of enrichment exercises in the geometry course, regardless of scholastic aptitude. (pre-service teachers; 111 students)

Weber, Audra Wheatly. Introducing Mathematics to First Grade Children: Manipulative vs Paper and Pencil. (University of California, Berkeley, 1969.) Dis. Abst. 30A: 3372-3373; Feb. 1970.

There was no significant difference between reinforcement of concepts through paper-and-pencil activities or with manipulative materials, although a trend favored the use of materials, especially for low-SES children. (grade 1; 6 classes)

Wess, Roger George. An Analysis of the Relationship of Teachers' Attitudes as Compared to Pupils' Attitudes and Achievement in Mathematics. (University of South Dakota, 1969.) Dis. Abst. 30A: 3844-3845; Mar. 1970.

No significant differences in teacher attitude scores attributable to the in-service program were found, nor were there any significant relationships between teachers' and pupils' attitudes. (grades 2-6; 535 pupils, 22 teachers)

Wesselman Roy Lee. A Study of the Extent of Association Among Teacher Dogmatism, Educational Attitudes, and Pupil Achievement in Mathematics. (Texas Tech University, 1969.) Dis. Abst. 31A: 88; July 1970.

Teachers who had "preservation of society" orientations differed sharply from those with "preservation of individual initiative" orientations; these were found to be the two underlying belief systems. Findings related to pupil mathematics achievement are not stated. (grade 6; 91 pupils, 53 teachers)

Whipkey, Kenneth Lee. A Study of the Interrelationship Between Mathematical Attitude and Mathematical Achievement. (Case Western Reserve University, 1969.) Dis. Abst. 30A: 3808; Mar. 1970.

A small but important relationship between mathematical attitude and achievement was indicated. (pre-service teachers; 175 students)

Whyte, Lillian Agnes. The Development of Classification Ability in Children of Below Average Intelligence. (Columbia University, 1969.) Dis. Abst. 30A: 4700-4701; May 1970.

Results indicate confirmation of Piaget's and Inhelder's hypotheses that the development of classification occurs in the pre-operational and concrete-operational periods, while ordering classes develops during the formal-operational period. The intellectually subaverage seem to follow the normal pattern and sequence of development, fixating at lower stages in the hierarchy. (IQ 30-89 [MR's; CA 8 up]; 120 pupils)

Wickens, David Lee. A Program to Foster Quantitative Reasoning in Preschool Children. (Columbia University, 1968.) Dis. Abst. 31A: 689-690; Aug. 1970.

No significant gains were found for the group using the program based on use of quantitative reasoning concepts in a variety of sequenced task situations, although learning was evidenced by ability to complete the tasks. (age 4; 36 children)

Williams, Macke Albert. Concept Development in Measurement at the Nursery School Level, with a New Manipulative Learning Aid. (Colorado State College, 1969.) Dis. Abst. 30A: 4166-4167; Apr. 1970.

An increase in achievement of linear measure objectives for units of one-half, one-fourth and one-eighth resulted from use of the manipulative aid for 18 of the children. (nursery school [ages 3, 4]; 21 pupils)

Winzenread, Marvin Russell. Consumable Materials: A Quasi-Programmed Procedure Experimentally Tested in the Inner-City Junior High School Mathematics Classroom. (Indiana University, 1969.) Dis. Abst. 30A: 4343; Apr. 1970.

Eighth grade classes using consumable materials with a quasi-programmed teaching procedure gained significantly more than the control group only in computation and attitude. No significant differences were found between seventh grade groups. (grades 7, 8; 59 classes)

Wolff, Harry Ludwig. A Study of the Use of Filmed Versus Live Classroom Observations in Arithmetic Content-Methods Classes at Wisconsin State University-Oshkosh. (University of Kansas, 1969.) Dis. Abst. 30A: 5331; June 1970.

Use of films (NCTM) were as effective as live observations in producing more positive attitudes, knowledge, and confidence. The films were more effective in developing skill in analyzing computational errors. (pre-service teachers; 126 students)

Wynroth, Lloyd Z. Learning Arithmetic by Playing Games. (Cornell University, 1970.) Dis. Abst. 31A: 942-943; Sept. 1970.

Groups taught new concepts verbally through a series of competitive games, followed by self-paced written work later, had significantly higher scores on achievement tests than those who had a "normal" program. (grades K, 1; 4 classes)

Young, James Heyward, Jr. The Use of a Computer-Based Resource Guide to Pre-Plan a Unit of Instruction and to Develop Student Attitudes Toward Mathematics. (State University of New York at Buffalo, 1970.) Dis. Abst. 31A: 1700; Oct. 1970.

Teachers who requested materials after preplanning were rated higher on instructional units than those who asked for a "dump".